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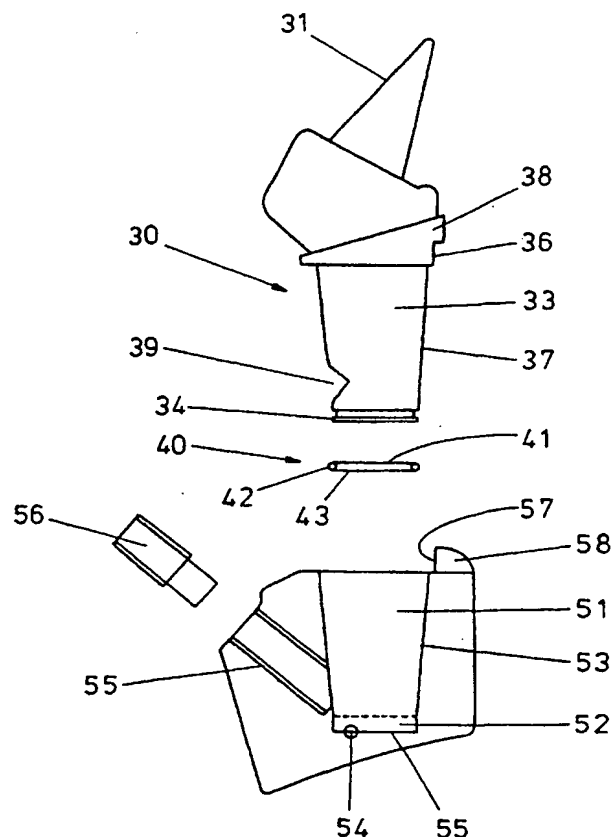
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(54) Title: PICK HOLDER AND PICK BOX ASSEMBLY

(57) Abstract

A semi-locking pick box assembly (10) comprises a pick holder (30), a hydraulic seal (40) and a closed pick box (50). The pick holder has a frusto conical shank (33) with a base (34) and the closed pick box (50) has a shank chamber (51), a piston chamber (52) and a hydraulic duct (54). The shank chamber (51) matches the shape of the frusto conical shank (33) so that the pick holder (30) can lockingly fasten to the closed pick box (50) when the pick holder and closed pick box are engaged. The piston chamber (52) communicates with the shank chamber (51) and houses the hydraulic seal (40) so as to form a hydraulic piston which can act on the base of the frusto conical shank. The hydraulic duct (54) communicates between the piston chamber (52) and externally of the closed pick box (50) so that hydraulic pressure can be applied via the hydraulic duct (54) to the hydraulic seal (40) to cause the pick holder (30), when lockingly engaging the closed pick box (50), to move axially and be released from the closed pick box (50).



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PICK HOLDER AND PICK BOX ASSEMBLY

The present invention relates to a semi-locking pick holder assembly and particularly to an assembly which allows a damaged pick holder of a road planer drum to be replaced. The semi-locking pick holder assembly ensures that the pick is sufficiently well attached to the drum to prevent excessive wear and also that a damaged pick holder can easily be removed without having to cut or damage any permanent joints.

Road planing machines are used in the repair of roads to remove the top surface of the road. Typically they have a rotating road planing drum which has a number of picks attached to it and helically arranged so as to cut material from the road and transport it to the ends or middle of the drum. In order to efficiently cut the top surface, the picks must be robustly secured to the drum. However, picks are often damaged when the road planing drum encounters features in the road such as metal work (e.g. manhole covers, tram lines and the like). When damaged the picks must be replaced, but this operation often requires that the picks, or their holders, have to be cut from the drum owing to the manner in which they have been secured to the drum, e.g. by welding.

Cutting the picks or their holders from the drum is a lengthy and difficult operation, often requiring the drum to be removed from the road planer. Replacement pick holders must then be attached with considerable accuracy to ensure the correct positioning of the pick with respect to the other picks on the drum so that the drum can operate correctly. The correct positioning of the pick holder can be hampered by damage caused when cutting off the damaged pick.

In a known device a pick arrangement has been provided including a pick box having an opening and a support member which is welded to a road planer drum. A pick holder having a shank and holding a pick is then attached to the pick box by

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engaging the pick holder shank and the opening in the pick box. The pick holder and pick box are then fastened together by a retaining screw so that the support member supports the pick holder. However, the shank and opening are loosely fitting so that it is the retaining screw which holds the pick box and pick holder together. As the shank and opening are loosely fitting there is a certain amount of play between them so that the continuous impacts experienced by the pick during the road planing operation causes the shank to move in the opening which leads to damaging wear of both the shank and opening so that the shank becomes looser, thereby exacerbating the problem of damage. This causes the pick to be less robustly supported and so reduces its cutting efficiency and the cutting efficiency of the drum. The damaged pick holder can easily be replaced but the damaged pick box can not be easily replaced as it is welded to the road planing drum and its replacement incurs the same problems as mentioned earlier. Hence there is a need for a replaceable pick holder arrangement which does not experience excessive wear thereby resulting in the problems it was originally designed to overcome.

According to the invention there is provided a semi-locking pick assembly comprising a pick holder and a pick box in which:

- the pick holder has a tapering shank; and

- the pick box has a shank chamber matching the shape of the tapering shank so that the pick holder can lockingly fasten to the pick box when the pick holder and pick box are engaged. The tapering shank may have a frusto conical shape. By providing a tapering shank and shank chamber of matching shape the pick holder and pick box can be locked together by a slight impact causing the shank to wedge into the shank chamber. As the shank surface and internal surface of the shank chamber are flush, there is no misfit and hence no room for play and so less damage can be caused by repeated impacts on a pick on the pick holder. No further devices are necessary to lock the pick holder to the closed pick box provided that the shape of the tapering shank and shank chamber match sufficiently closely.

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The pick box may be a closed pick box; i.e. there is no access to the shank by which a tool may be used to remove the shank from the pick box when the pick holder and pick box are lockingly engaged.

Preferably the assembly includes a seal device, the tapering shank has a base and the pick box has a piston chamber and a duct, with the piston chamber communicating with the shank chamber and housing the seal device so as to form a piston which can act on the base of the tapering shank, and the duct communicating between the piston chamber and externally of the pick box so that pressure can be applied via the duct to the seal device to cause the pick holder, when lockingly engaging the pick box, to move and be released from the pick box.

Preferably, the tapering shank has a retaining formation and the pick box has a retaining device which can engage the retaining formation so as to fasten the pick holder to the pick box when the pick holder and pick box are engaged.

The retaining formation may be a resiliently biased ring around the shank of the pick holder and the retaining device may be a circumferential groove around an interior wall of the pick box. Alternatively, the retaining formation may be a recess in the shank of the pick holder and the retaining device may be a threaded bore and a threaded element which can be screwed into the bore so that it engages the retaining formation. The recess may be a circumferential groove around the shank.

Preferably, the seal device is a planar element with a seal around its periphery so as to allow the seal device, when located in the piston chamber, to act as a piston. Preferably, the piston chamber is cylindrical.

Preferably, the duct communicates with a bottom face of the piston chamber so as to allow one of hydraulic and pneumatic pressure to be applied to an underside of the seal device.

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Preferably, there is a locating device to ensure that the pick holder is at a correct orientation with respect to the pick box when they are lockingly fastened together.

Preferably, the locating device comprises a substantially planar pick holder surface and a substantially planar closed pick box surface.

The invention will be better understood from the following detailed description of one illustrative specific embodiment and with reference to the accompanying drawings, in which:

Figure 1 shows a semi-locking pick assembly according to the present invention mounted on the surface of a road planer drum;

Figure 2 shows an exploded view of the assembly using a modified pick holder; and

Figure 3 shows a view of the pick holder part of the assembly.

Identical articles in the different Figures share common reference numerals. With reference to Figures 1-3 there is shown a semi-locking pick assembly, generally designated by reference numeral 10, welded to the surface of a road planer drum 20. The assembly comprises a pick holder 30, a hydraulic seal 40 and a closed pick box 50. The assembly is semi-locking: i.e. the pick holder is fastened to the pick box and mechanically locked to the pick box without the need for any other devices while the pick holder can still be extracted from the pick box when desired.

The pick holder 30 bears a pick 31 having a strengthened cutting tip 32 and has a tapered shank 33 having a frusto conical shape with a base 34. The shank has a retaining formation 35 in the form of a recess which is a circumferential groove which extends around the shank. The pick holder has a

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substantially planar pick holder surface 36 which is part of a locating device as will be described later.

The seal device 40 is a disc 41 with a seal 42 around its circumference.

The pick box 50 is a closed pick box: i.e. there are no openings in it via which a tool may be inserted to mechanically remove a pick holder locked to it e.g. by hitting the base of the pick holder. The closed pick box has a shank chamber 51 and a piston chamber 52 which communicate with each other. The geometry of the shank chamber matches the geometry of the shank: i.e. the shape of the shank chamber is such that when the shank mates with the shank chamber the surface of the shank 37 and the shank chamber wall 53 are entirely flush so that the shank can be locked in the shank chamber by a slight impact which forces the shank into the shank chamber. This method of locking the shank in the shank chamber reduces the wear of the pick box compared to previous arrangements as there is no play between the shank and the shank chamber and so the repeated impacts of the pick with the material being cut does not generate damaging impacts between the pick holder shank and the interior of the pick box.

The piston chamber 52 is located below the shank chamber and is cylindrical. A duct 54 communicates between the bottom face of the piston chamber 55 and externally of the pick box. The hydraulic seal, piston chamber and hydraulic duct are arranged to operate as a piston. The hydraulic seal is located in the piston chamber and when hydraulic pressure is applied to the underside 43 of the hydraulic seal via the hydraulic duct the hydraulic seal moves upwards in the piston chamber and towards the shank chamber acting as a piston. Alternatively pneumatic pressure may be used.

The pick box has a retaining device in the form of a threaded bore 55 and a threaded element 56 which can be screwed into the

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bore so that an end of the element protrudes into the shank chamber.

As an alternative to the threaded bore and element co-operating with a recess a spring retaining ring and groove arrangement may be used. The tapering shank may have a spring retaining ring extending around it and the inner wall of the shank chamber may have a groove circumferentially extending around it. The sprung ring can then engage the groove so as to further secure the shank in the closed pick box. Access may be provided to the ring to disengage it from the groove to allow the assembly to be disassembled.

The pick box has a substantially planar surface 57 which acts as part of a locating device as will be described later.

In use, a number of closed pick boxes are secured to the surface of a road planer drum 20 in the correct cutting pattern and orientation so that, when picks are attached to the boxes, the picks will be correctly oriented with respect to the drum. Typically the pick boxes are welded to the surface of the road planer drum. A hydraulic seal is placed in the piston chamber and a closure element, such as a grub screw, is located in the external entrance to the hydraulic duct so as to prevent it becoming blocked by cut material or dirt.

The shaft of a pick holder is then inserted into the shank chamber of a pick box. The pick box planar surface 57 and pick holder planar surface 36 co-operate to act as a locating device. As the pick box has been welded on with a predetermined orientation with respect to the drum it is important to ensure that the pick on the pick holder points in the desired direction also. This is achieved by the locating device ensuring that the pick holder can only be locked to the pick box when the two are correctly oriented with respect to each other. The pick box surface 57 is borne by a raised member 58 extending across the pick box. The pick holder

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surface 36 is borne by a head 38 of the pick holder above the shank. The raised member 58 prevents the shank being fully inserted into the shank chamber unless the pick holder is correctly oriented, by rotation about its longitudinal axis, so that the pick holder surface 36 and pick box surface 57 are parallel and adjacent. When they are so arranged the shank can be fully inserted into the shank chamber. The locating device does not act to provide support for the pick holder but acts only to ensure the correct orientation of the pick holder with respect to the pick box.

When the shank is fully inserted, a light tap with a tool is sufficient to lock the pick holder into the pick box so that they are lockingly fastened together. The pick holder and pick box are locked together by virtue of the geometry of the frusto conical shank and matching geometry of the shank chamber alone. As the gaps 59 between the head 38 and the pick box and member 58 indicate, the pick holder is supported by the action of the shaft in the shaft chamber alone and not by the head abutting the pick box or member. A threaded element 56, such as a screw, can then be screwed in to the threaded bore 55 until its head abuts the recess in the shank so as to further secure the pick holder in the pick box. The screw can help to drive the shank into the shank chamber to ensure that the pick holder is locked into the pick box should the light tap to engage the shank and shank chamber have been insufficient. Alternatively a spring retaining ring and co-operating groove may be used. The semi-locking pick assembly is now ready for use in the cutting operation.

Should a pick or the pick holder become damaged in the cutting operation it can easily be replaced without having to cut off the pick box. The threaded element is removed from the threaded bore. The closure element is removed from the hydraulic duct and a hydraulic line is connected to the hydraulic duct by a suitable adapter. Hydraulic pressure is applied to the other end of the hydraulic line by a pump or the

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like. The hydraulic pressure is communicated to the underside of the hydraulic seal in the piston chamber by means of the hydraulic duct. The hydraulic seal abuts the base 34 of the shank and acts as a piston head to apply a force to the base of the shank which acts to release the shank from the shank chamber and so releases the damaged pick holder. Alternatively a pneumatic system may be used. A new pick holder can then be fastened to the pick box as described previously and the cutting operation restarted.

If the hydraulic/pneumatic release system is not utilised then a suitable tool may be used to release the pick holder from the pick box by acting on part of the pick holder not engaged in the shank chamber of the pick box so as to un-lock the pick holder from the pick box once the threaded element has been removed.

The pick holder shown in Fig. 2 has a modified retaining formation. The recess 39 in the shank is not circumferential but rather cuts a chord extending across the surface of the shank, but not all the way around the shank. In this way a greater surface area of the shank is available to engage the shank chamber wall than compared with the pick holder shown in Figures 1 & 3. However, the circumferential groove shown in Figures 1 & 3 is easier to manufacture.

CLAIMS:

1. A semi-locking pick assembly comprising a pick holder and a pick box in which:

the pick holder has a tapering shank; and

the pick box has a shank chamber matching the shape of the tapering shank so that the pick holder can lockingly fasten to the pick box when the pick holder and pick box are engaged.

2. An assembly according to claim 1, in which the tapering shank has a frusto conical shape.

3. An assembly according to claim 1 or claim 2 and having a seal device, in which:

the tapering shank has a base; and

the pick box has a piston chamber and a duct, with the piston chamber communicating with the shank chamber and housing the seal device so as to form a piston which can act on the base of the tapering shank, and the duct communicating between the piston chamber and externally of the pick box so that pressure can be applied via the duct to the seal device to cause the pick holder, when lockingly engaging the pick box, to move and be released from the pick box.

4. An assembly according to any preceding claim, in which the tapering shank has a retaining formation and the pick box has a retaining device which can engage the retaining formation so as to fasten the pick holder to the pick box when the pick holder and pick box are engaged.

5. An assembly according to claim 4, in which the retaining formation is a resiliently biased ring around the shank of the pick holder and the retaining device is a circumferential groove around an interior wall of the pick box.

6. An assembly according to claim 4, in which the retaining formation is a recess in the shank of the pick holder

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and the retaining device is a threaded bore and a threaded element which can be screwed into the bore so that it engages the retaining formation.

7. An assembly according to any preceding claim, in which the seal device is a planar element with a seal around its periphery so as to allow the seal device, when located in the piston chamber, to act as a piston.

8. An assembly according to any preceding claim, in which the duct communicates with a bottom face of the piston chamber so as to allow one of hydraulic and pneumatic pressure to be applied to an underside of the seal device.

9. An assembly according to any preceding claim, in which there is a locating device to ensure that the pick holder is at a correct orientation with respect to the pick box when they are lockingly fastened together.

10. An assembly according to claim 9, in which the locating device comprises a substantially planar pick holder surface and a substantially planar pick box surface.

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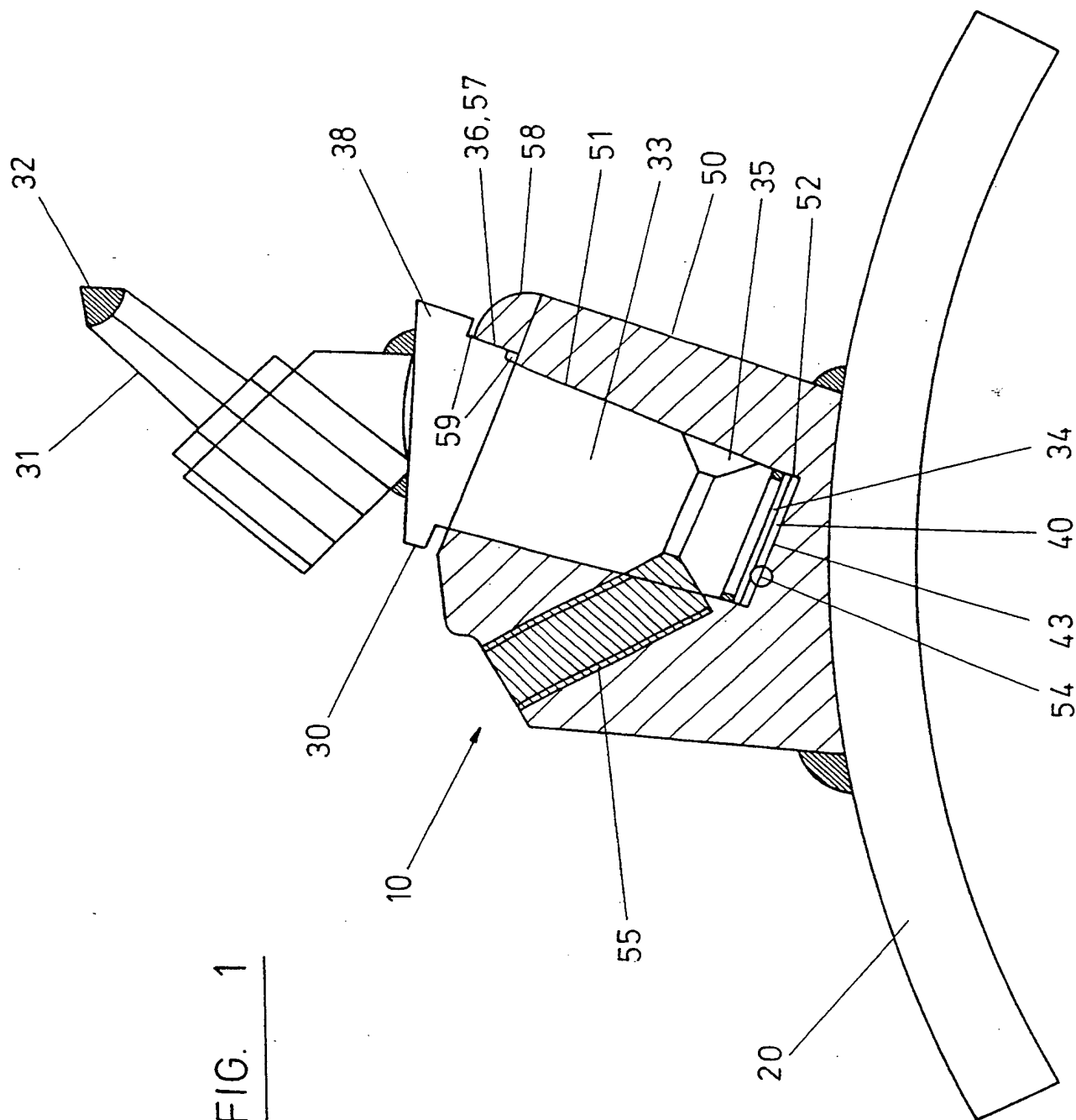


FIG. 1

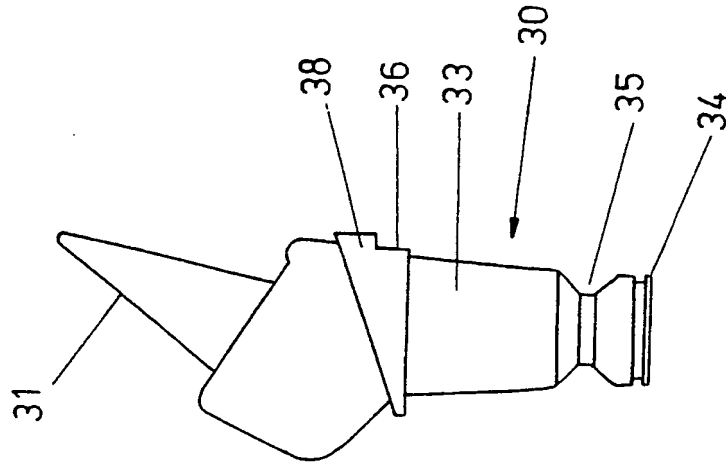


FIG. 3

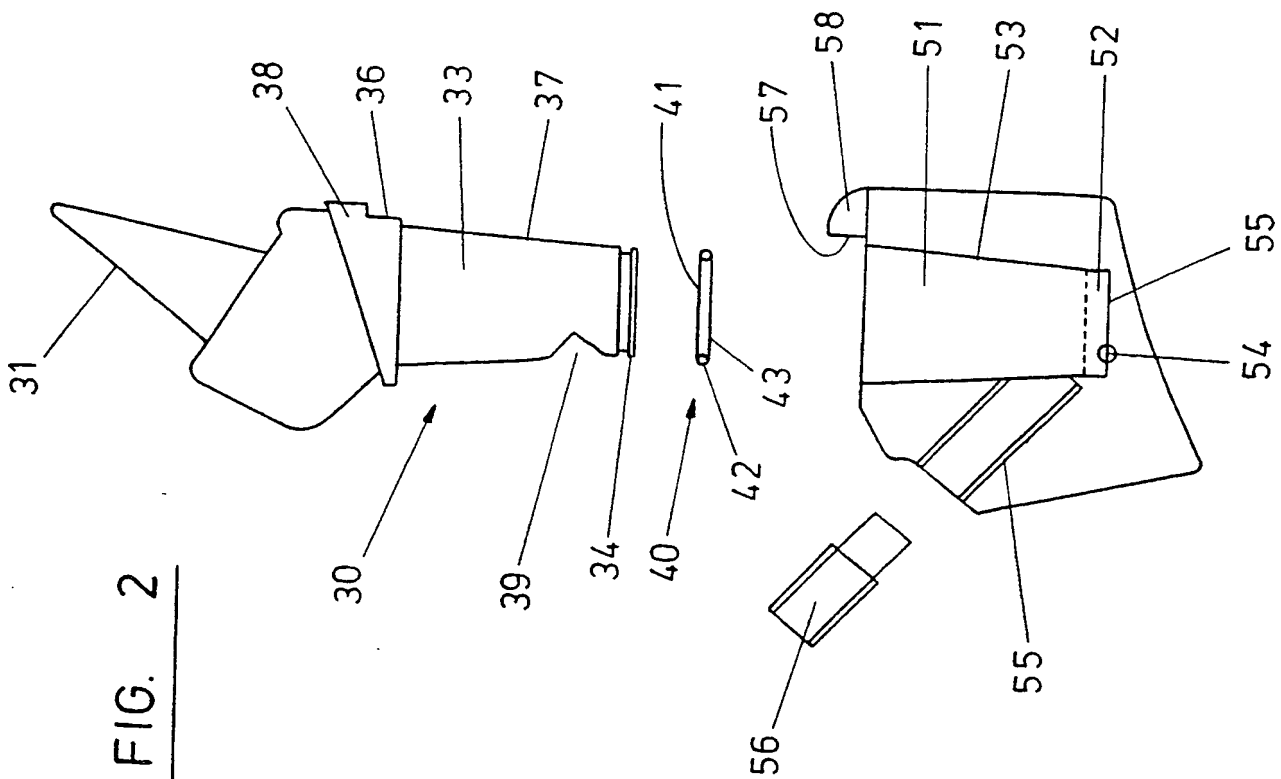


FIG. 2

INTERNATIONAL SEARCH REPORT

International Application No

PCT/GB 98/00493

A. CLASSIFICATION OF SUBJECT MATTER

IPC 6 E21C35/193

According to International Patent Classification (IPC) or to both national classification and IPC

B. FIELDS SEARCHED

Minimum documentation searched (classification system followed by classification symbols)

IPC 6 E21C

Documentation searched other than minimum documentation to the extent that such documents are included in the fields searched

Electronic data base consulted during the international search (name of data base and, where practical, search terms used)

C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
X	AU 564 079 B (CINCINNATI MINE MACHINERY CO) 30 July 1987	1,2,4,6
Y	see the whole document ---	5,9,10
Y	DE 23 30 297 A (KENNAMETAL INC) 10 January 1974 see page 8; figures 3-5 ---	5
Y	AU 536 728 B (KENNAMETAL INC) 24 May 1984 see page 11, paragraph 3 - page 12, line 1; figure 6 ---	9,10
X	GB 2 223 045 A (SANDVIK AUSTRALIA PTY LTD) 28 March 1990 see page 3, line 10 - line 31 ---	1,2,4
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☒ Further documents are listed in the continuation of box C.

☒ Patent family members are listed in annex.

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INTERNATIONAL SEARCH REPORT

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C.(Continuation) DOCUMENTS CONSIDERED TO BE RELEVANT

Category	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
A	EP 0 521 413 A (BOART HWF GMBH CO KG) 7 January 1993 see abstract; figures -----	3,7,8
A	DE 12 75 498 B (GEBR. EICKHOFF) 22 August 1968 see column 2, line 20 - line 40; figure 1 -----	3,8
A	DE 94 02 242 U (VOEST ALPINE BERGTECHNIK) 24 March 1994 see page 6, paragraph 2; figure 1 -----	3

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INTERNATIONAL SEARCH REPORT

information on patent family members

International Application No

PCT/GB 98/00493

Patent document cited in search report	Publication date	Patent family member(s)	Publication date
AU 564079 B	30-07-87	US 4337980 A	06-07-82
		AU 3684884 A	26-04-85
		AU 565475 B	17-09-87
		AU 3566884 A	28-03-85
		AU 542087 B	07-02-85
		AU 5961880 A	15-10-81
		CA 1148571 A	21-06-83
		CA 1159477 A	27-12-83
		DE 3026930 A	15-10-81
		ZA 8004731 A	26-08-81
DE 2330297 A	10-01-74	US 3841708 A	15-10-74
		AU 5687873 A	19-12-74
		CA 985711 A	16-03-76
		CA 988107 A	27-04-76
		CA 988108 A	27-04-76
		ZA 7303960 A	29-05-74
AU 536728 B	24-05-84	AU 5858880 A	26-11-81
GB 2223045 A	28-03-90	NONE	
EP 0521413 A	07-01-93	DE 4121674 C	11-02-93
		AT 109247 T	15-08-94
		DE 59200320 D	01-09-94
DE 1275498 B		NONE	
DE 9402242 U	24-03-94	US 5498069 A	12-03-96

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